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ABSTRACT

Comprehensive Achievement Monitoring (CAM), developed at Stanford University in 1967, was introduced into a pre-algebra course in Moanalua High School in Hawaii to help teachers by providing information on the progress of individual students and of the total class. The computer package is used to correct each student's answer sheet and to prepare reports for both the student and the teacher. An interesting feature, unique to this application of CAM, is a computer rearrangement of the rank of the students in a class versus the rearrangement of the test problems from easiest to most difficult, determined by the class performance on the test. Finally, it contains an entropy, in the objective and item analysis, which measures the degree of scattering in the responses on each problem. This package will begin to be fully implemented in 1977-1978. (VT)

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CAM IN HAWAII

(A JAPANESE-AMERICAN EXPERIENCE)

by

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IR 005 488

CAM IN HAWAII
(A JAPANESE-AMERICAN EXPERIENCE)

Computer Managed Instruction projects are plentiful throughout the country; several commercial firms have fully-developed CMI packages for sale, and many school districts have developed their own packages, usually through federal funding. A review of reports on available CMI programs clearly indicates that the successful ones are a result of teacher inservice education and teacher preparation and decision-making at the local level.

In CMI, the computer is used to help teachers by providing information on the progress on individual students and of the total class. The system can help the teacher to measure the effectiveness of his teaching, the progress of each student in his learning, and the necessary allocation of resources.

Before effective instruction takes place, the course must be defined in terms of the desired outcomes (the instructional objectives that the student is expected to meet). Given such a set of objectives, instruments must be designed to determine how far each student is progressing toward meeting those objectives. The testing of each student with regard to these objectives must be an integral part of the instructional plan of the course; the results of each test must be used to provide individual and/or group remediation, as the results indicate. That is, tests should not be an end in themselves; they should contribute to the student's further learning.

Under normal classroom conditions, however, it is difficult for a teacher to find the time to fully analyze each test; just getting the test papers corrected, scored, and returned to the students within a short time is a demanding task. Teachers are hard-pressed to find the time to do item analysis; much less to make individual prescriptions for each student to remedy those areas of weakness that become apparent in the taking of the test.

The computer then becomes a useful tool for the teacher. It can be designed to accomplish these tasks:

1. Correct each student's answer sheet; students record their answers on a computer mark reader (OMR) card.
2. Prepare reports for the student: (EXHIBIT A)
   a. Student Performance List
   b. Student Summary List (Mastery Level)

   These reports for the student include the following items:
   a. Test item number correlated with the number of the instructional objective being tested.
   b. Whether instruction has already taken place on that objective.
   c. Whether the student did the item correctly.
   d. Student score on that test form, and a cumulative listing of scores on all previous forms.
3. Prepare reports for the teacher: (EXHIBIT B)
   a. Input Data List. (A list of the responses made by the students to each problem.)
   b. Correct Answer List. (A list of those problems that were correctly answered by each student.)
   c. S-P Score Table.
   d. Objective and Item Analysis.
   e. Cumulative Item Analysis.
   f. Course Summary by Objectives.
   g. Course Summary by Student.

The teacher has the freedom to determine the scope of each test. At Moanalua High School where this project is being piloted, the math department decided to capitalize on the "Comprehensive" part of the CAM package and always administer tests based on the total course. Students will then be attempting both problems on which instruction has already been completed, and problems not yet encountered but for that very fact may be challenging to the student. When a student responds to such challenge, he may accelerate his learning independently; or in class sessions, when a new topic is introduced, he may recognize the type of problem as one he had tried at some time on one of these comprehensive tests, called "monitors", and that recognition may "legitimatize" the new topic and motivate him toward more careful concentration.

CAM is the acronym for Comprehensive Achievement Monitoring, a CMI package which was developed at Stanford University in 1967 and is currently being used by the Sequoia Union School District in Redwood City, California.

In February 1976 two teachers, Mrs. Barbara Kagan from Moanalua High School and Mrs. June Yamashita from Kailua High School entered an agreement with the Japan-America Institute of Management Science (JAIMS), a Hawaii non-profit educational corporation, to perform a joint research on a Computer Managed Instruction project. JAIMS provided for this project a full-time educational systems developer, Mr. Masaru Takahashi from the Fujitsu Computer Company in Tokyo, Japan. The project which will hereinafter be called JAIMS-CAM or merely CAM for short, is similar in many ways to the CAM package being used by John Easter in Redwood City. JAIMS-CAM, however, does more than just "monitor" the progress of individual students and of the total class. Thanks to Mr. Takahashi, a number of very interesting features have been included on our system which are the result of current educational studies being done in Japan.

The most interesting and fascinating feature unique to JAIMS-CAM is the S-P Score Table (Student-Problem Score Table - See EXHIBIT B). The S-P Score Table is a computer rearrangement of the rank of the students in a class (the vertical scaling) versus the rearrangement of the test problems from easiest to most difficult (the horizontal scaling). The degree of difficulty of the problems is determined by the class' performance on the test. This is a multiple-scaling procedure that was developed by Professor L. Guttman in Europe.

Two curves, the S-curve designated by the astericks (*) and the P-curve designated by the dots (.) are plotted on this S-P matrix. The (*) indicates the performance of each student and the (.) indicates the performance of the class on each problem. That is, the number of students who did correctly answer each problem.

The perfect (ideal) pattern for the ith student with a score of j correct answers, using such an arrangement of ranked students and ranked problem will show 1's (indicating correct answers) to the left of the * and blanks or zeros (indicating wrong answers) to the right of the *. The * denotes the jth problem as ranked.

On the "EASY TEST" in fig. 1, ABLE's performance is ideally patterned. Likewise, one finds that EDDIE's is also although at first glance, it doesn't appear to be so. Note that in EDDIE's case, he missed problem #1 (indicated by the blank to the left of the *) but did get problem #9 (indicated by the 1 to the right of the *). Both problems 1 and 9 are equally ranked. That is,

4 students each answered both problems correctly. This fact is reflected in EDDIE's warn which is identical to ABLE's 0.00. The warn will be discussed subsequently in this report.

					PROBLEMS											
NAME	CR	AVE	WARN	EV	2	4	7	8	10	12	3	6	1	9	11	5
ABLE	12	100	0.00		1	1	1	1	1	1	1	1	1	1	1	1
BAKER	11	92	0.44		1	1	1	1	1	1	1	1	1	1		1
CHARLIE	10	83	0.28		1	1	1	1	1	1	1	1	1		1	
EDDIE	9	75	0.00		1	1	1	1	1	1	1	1		1		
DAVE	9	75	0.27		1	1	1	1	1	1			1	1	1	
correct ans score					5	5	5	5	5	5	4	4	4	4	3	2

DIFFERENCE = .10

——— S-curve

------ P-curve

"EASY TEST"

fig. 1

					PROBLEMS										
NAME	CR	AVE	WARN	EV	3	1	2	4	8	12	11	7	5	6	8	10
FRAN	5	42	0.14		1	1	1	1		1						
GEORGE	5	42	0.28		1	1		1	1		1					
HARRY	4	33	0.45		1		1		1			1				
IVAN	3	25	0.38		1			1					1			
JACK	2	17	0.26			1	1									
correct ans score					4	3	3	3	2	1	1	1	1	0	0	0

DIFFERENCE = .13

——— S-curve

------ P-curve

"HARD TEST"

fig. 2

It is evident that the nature of the test (difficult or easy) as reflected by the class can be determined by inspecting this S-P curve. It would appear that we will obtain the following basic shapes as shown in fig. 3.

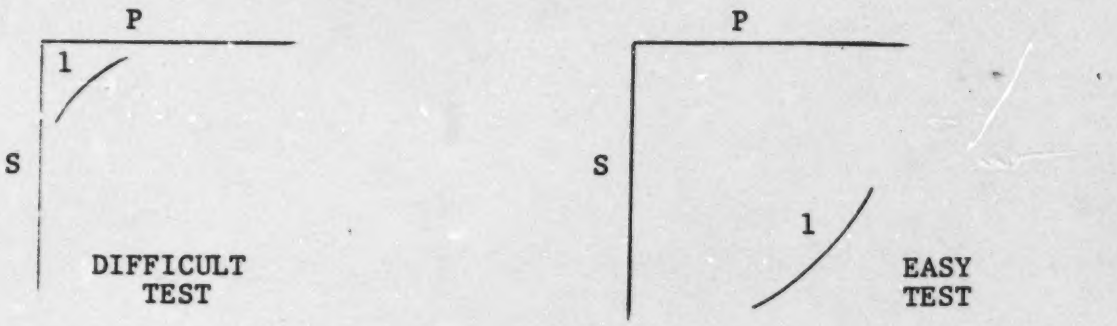

fig. 3

This S-P Score Table, prepared as indicated above, provides the setting for the calculation of two very interesting index variables.

1. The first is called the differential coefficient (DIFFERENCE). It represents the ratio of the area between the S-curve (*) and the P-curve (.) to the area of the whole S-P Score matrix.

   As previously mentioned, the ideally patterned S-curve and P-curve would find these two curves coinciding. Thus, the "ideal" difference would be zero (0), since the area between the two curves would be zero.

   This means that each of the students is said to reflect the performance of the entire class. The ith student can get correctly those problems which many other students in the class can correctly answer.

2. The second index variable that can be determined is called the warning coefficient (warn). Professor Hiroichi Fujita of Keio University has taken the covariance from statistics and defined a new variable called the warn, using the S-P Score matrix as a scatter diagram.

   In statistics, when one attempts to discover the approximate relationship of two variables one usually begins by graphing the data as points in the x,y plane. Such a graph is called a scatter diagram.

   In the S-P Score matrix, we have such a scatter diagram. Its variables are S (student performance score)

and P (problem performance score) for the class under investigation. The warn is defined as

$$\text{warn} = 1 - \frac{C_i}{C_{i(p)}} \qquad (i)$$

where C_i is the covariance for the actual performance of the ith student;

and

$C_{i(p)}$ is the covariance of the ideal scatter pattern of the ith student.

The ideal or perfect pattern covariance is a determinable constant which is a function of the size of a class, the number of problems on a given test, and the mean performance of the class on each problem on the given test.

If the value of C_i is large, then the performance of the ith student is said to reflect the performance of the entire class on the test. That is, the ith student can get the correct solutions for problems which many other students can correctly answer.

In the formula for the warn, $C_{i(p)}$ represents the covariance of the ideally patterned performance of the ith student with respect to his class. Theoretically speaking, he should have gotten correctly all problems to the left of the * and none to the right, since those problems to the right are more difficult.

Hence, the warn (1) will yield a zero (0) if the pattern is ideal and the warn will range in value from 0 That is,

$$0 \leq \text{warn}$$

A large warn would be an indicator of abnormal patterns of scatter.

Remark. Our system is designed to print a single question mark (?) for EV when warn is greater than 0.50 and a double question mark (??) for EV when warn is 0.75 or larger.

The mathematical description of the warn and its derivation follows:

C_i is defined by the formula

$$C_i = \frac{\sum_{j=1}^{n} (y_{ij} - \frac{1}{n} y_{i\bullet})(y_{\bullet j} - \bar{M})}{n} \qquad (2)$$

where (i) y_{ij} is the response of the ith student on the jth question. (The response is either 1 or 0.)

(ii) n is the total number of problems on the test.

(iii) $y_{i\bullet}$ is the total number of correct responses for the ith student.

(iv) $y_{\bullet j}$ is the total number of students who correctly answered the jth question.

(v) $\bar{M}$ is the average number of correct responses for each of the n problems on the test.

Multiplying out the parentheses in (2) and summing term by term will show that the numerator can be written as $\sum_{j=1}^{n} y_{ij}y_{\bullet j} - \bar{M}y_{i\bullet}$. Hence, we get

$$C_i = \frac{1}{n}\left(\sum_{j=1}^{n} y_{ij}y_{\bullet j} - \bar{M}y_{i\bullet} \right). \qquad (3)$$

Since $\sum_{j=1}^{n} y_{ij}$ is the sum of all the responses (1, if correct and 0, if wrong) of the ith student on a test consisting of n questions, it is only necessary to sum up to the jth problem in the perfect (ideal) case. All subsequent problems, those to the right of the * would be 0's. That is to say, the ith student's total number of correct responses,

$$y_{i\bullet} = \sum_{j=1}^{y_{i\bullet}} y_{ij} \quad \text{or} \quad \sum_{j=1}^{y_{i\bullet}} 1 \ ,$$

since $y_{i\bullet}$ (the student's score) would correspond to the jth problem as ranked.

Therefore,

$$C_{i(p)} = \frac{1}{n}\left(\sum_{j=1}^{y_{i\bullet}} y_{\bullet j} - \bar{M}y_{i\bullet} \right) \qquad (4)$$

The warn then becomes

$$\text{warn} = 1 - \frac{\frac{1}{n}\left(\sum_{j=1}^{n} y_{ij}y_{\bullet j} - \bar{M}y_{i\bullet} \right)}{\frac{1}{n}\left(\sum_{j=1}^{y_{i\bullet}} y_{\bullet j} - \bar{M}y_{i\bullet} \right)} \qquad (5)$$

$$= \frac{\sum_{j=1}^{y_{i\bullet}} y_{\bullet j} - \bar{M}y_{i\bullet} - \sum_{j=1}^{n} y_{ij}y_{\bullet j} + \bar{M}y_{i\bullet}}{\sum_{j=1}^{y_{i\bullet}} y_{\bullet j} - \bar{M}y_{i\bullet}}$$

$$= \frac{\sum_{j=1}^{y_{i\bullet}} y_{\bullet j} - \left(\sum_{j=1}^{y_{i\bullet}} y_{ij}y_{\bullet j} + \sum_{j=y_i+1}^{n} y_{ij}y_{\bullet j} \right)}{\sum_{j=1}^{y_{i\bullet}} y_{\bullet j} - \bar{M}y_{i\bullet}}$$

$$= \frac{\sum_{j=1}^{y_{i\bullet}} (1 - y_{ij})y_{\bullet j} - \sum_{j=y_i+1}^{n} y_{ij}y_{\bullet j}}{\sum_{j=1}^{n} y_{\bullet j} - \bar{M}y_{i\bullet}}$$

Interpreting the warn in terms of the S-P matrix, we have the warn as the the quotient of two differences. More specifically,

$$\text{warn} = \frac{\begin{array}{l}\textit{The sum of the number of students who correctly answered those problems missed by the ith student to the left of the *. (0's)} \\ - \\ \textit{The sum of the number of students who correctly answered those problems that the ith student was able to answer to the right of the asterick. (1's)}\end{array}}{\begin{array}{l}\textit{The sum of the number of students who correctly answered those problems to the left of the *.} \\ - \\ \textit{The product of the score of the ith student and the mean (average number of correct responses for each of the n problems on the test.}\end{array}}$$

The warning coefficient (warn) appears to be a very useful tool for helping the teacher to determine the validity of the scores obtained by any one individual student in a multiple-choice situation on which random guessing may occur and therefore, the score may not truly reflect how much a student really knows.

In JAIMS-CAM a second warning coefficient (warn) has been programmed which appears for each of the test problems on the OBJECTIVE AND ITEM ANALYSIS report to the teacher. (See EXHIBIT B) It is also calculated from the S-P Score matrix and reflects the scattering patterns of the responses (correct or incorrect) made by the student on each problem. (The aforementioned warn (5) reflected the scattering patterns of the performance of each student.) This second warn, the warn of the jth problem is defined as

$$\text{warn} = \frac{\textit{The sum of those students who missed the jth problem above the (.). (0's)} - \textit{The sum of the scores of those students who correctly answered the jth problem below the (.). (1's)}}{\textit{The sum of the scores of all students who correctly answered the jth problem above the (.)} - \textit{The product of the total number of correct responses for the jth problem and the mean (class average).}}$$

A high warn here can indicate several different things: (1) A difficult problem; (2) A "tricky" problem, one designed to entrap a student into making a particular response when another response is desired; and (3) A misconception and/or lack of mastery of a given skill or objective. As with the first warn, the system is programmed to print out a single (?) for EV if warn is less than .5 or is .5 when rounded up and a double (??) for EV if the warn is .5 or larger on the OBJECTIVE AND ITEM ANALYSIS report.

Finally, JAIMS-CAM contains an entropy which is found on the OBJECTIVE AND ITEM ANALYSIS. It is another variable which can be useful to the teacher. The entropy measures the degree of scattering found in the reponses made by the class on each problem. Its value is largest when the scattering of the responses is evenly spread over all the possible choices. On the JAIMS-CAM as we have it designed, we have allowed for seven (7) possible responses; the five (5) that are indicated on the test, no responses, and a choice other than 1 to 5. The latter was necessary because we have

used in our initial development of this system a general purpose OMR card for answer sheet that has other possible markings. The entropy is defined as

$$\text{Entropy} = -\sum_{i=1}^{7} P_i \log_2 P_i ,$$

where P_i is the fraction of the class that made the ith response as its choice on the jth question.

(Note: Entropy ranges from 0.0 to 2.5)

In conclusion, I believe that we have a very unique CMI package, thanks to the efforts of Mr. Masaru Takahashi who did share with us his valuable knowledge and expertise of current Japanese educational studies coupled with his computer technology knowledge. It is difficult to say at this point what all the implications are regarding his unique design educationally and/or otherwise. We will begin to fully implement this package in the next academic year, 1977-78 and are eagerly looking forward to doing so. At the present time, we have only been using this package on our pre-algebra level courses and as yet have very little data to relate to.

218 MOANALUA
318 PRE-ALGEBRA
313 ITO L

STUDENT PERFORMANCE LIST

-----TEST ADMINISTRATION TIME 5 (DATE 401)-----

884386 9 BLANCHARD ROBIN L

FRACTION CORRECT ON ALL ITEMS IS 23/35
FRACTION CORRECT ON POST ITEMS IS 0/ 0
FRACTION CORRECT ON RETENTION ITEMS IS 23/33

ON	OBJ	INS	COR	RPS	JUD
11	8011	3	3	3	*
12	3041	3	4	4	*
13	1094	3	4	5	
14	6042	3	5	5	*
15	5015	3	4	4	*
16	9022	3	1	1	*
17	5113	3	2	2	*
18	8061	3	2	2	*
19	11081	3	4	4	*
20	2134	3	5	2	
21	8071	3	3	2	
22	7032	3	2	5	
23	11044	3	1	1	*
24	5081	3	3	2	
25	2041	3	3	3	*
26	9033	3	2	5	
27	1054	3	2	5	
28	4052	3	4	4	*
29	2145	3	5	5	*
30	9012	3	4	4	*
31	10161	1	2	3	
32	3123	1	3	1	
33	10091	3	3	1	
34	11014	3	3	3	*
35	9063	3	2	2	*
36	5072	3	4	4	*
37	3072	3	5	5	*
38	10064	3	2	2	*
39	7072	3	2	2	*
40	7102	3	3	3	*
41	12011	3	2	2	*
42	5044	3	3	3	*
43	4035	3	3	4	
44	4112	3	2	4	
45	7015	3	3	3	*

ADM	TOTAL	POST	RETN
1	16/40	0/ 0	0/ 0
2	23/40	3/ 5	13/15
3	22/40	5/ 5	12/20
4	16/25	6/11	8/10

STUDENT PERFORMANCE LIST

218 MOANALUA
318 PRE-ALGEBRA
313 ITO L

766362 9 YAMAGUCHI LORI K

-----TEST ADMINISTRATION TIME 5 (DATE 401)-----

FRACTION CORRECT ON ALL ITEMS IS 24/35
FRACTION CORRECT ON POST ITEMS IS 0/ 0
FRACTION CORRECT ON RETENTION ITEMS IS 22/33

ON	OBJ	INS	COR	RPS	JUD
11	8011	3	3	3	*
12	3041	3	4	4	*
13	1094	3	4	4	*
14	6042	3	5	5	*
15	5015	3	4	4	*
16	9022	3	1	1	*
17	5113	3	2	1	
18	8061	3	2	1	
19	11081	3	4	4	*
20	2134	3	5	5	*
21	8071	3	3	3	*
22	7032	3	2	2	*
23	11044	3	1	1	*
24	5081	3	3	3	*
25	2041	3	3	5	
26	9033	3	2	4	
27	1054	3	2	2	*
28	4052	3	4	1	
29	2145	3	5	5	*
30	9012	3	4	4	*
31	10161	1	2	2	*
32	3123	1	3	3	*
33	10091	3	3	3	*
34	11014	3	3	3	*
35	9063	3	2	1	
36	5072	3	4	4	*
37	3072	3	5	4	
38	10064	3	2	2	*
39	7072	3	2	4	
40	7102	3	3	2	
41	12011	3	2	2	*
42	5044	3	3	3	*
43	4035	3	3	2	
44	4112	3	2	1	
45	7015	3	3	3	*

ADM	TOTAL	POST	RETN
1	25/40	0/ 0	0/ 0
2	25/40	3/ 5	15/15
3	23/40	3/ 5	12/20
4	20/25	7/11	9/10

STUDENT SUMMARY LIST

218 MOANALUA
318 PRE-ALGEBRA
313 ITO L

884386 BLANCHARD ROBIN L

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1
THE MASTERY LEVEL FOR AN OBJECTIVE IS 70% AND ABOVE

** MASTERY **

OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE
101	100% (1/ 1)	103	100% (1/ 1)	104	100% (1/ 1)	106	100% (2/ 2)
108	100% (1/ 1)	111	100% (1/ 1)	112	100% (2/ 2)	113	100% (1/ 1)
201	100% (1/ 1)	203	100% (1/ 1)	206	100% (1/ 1)	207	100% (2/ 2)
209	100% (2/ 2)	210	100% (1/ 1)	212	100% (1/ 1)	214	100% (2/ 2)
302	100% (2/ 2)	306	100% (2/ 2)	307	100% (2/ 2)	311	100% (2/ 2)
402	100% (1/ 1)	404	100% (1/ 1)	405	100% (1/ 1)	501	100% (3/ 3)
502	100% (1/ 1)	503	100% (1/ 1)	504	100% (1/ 1)	509	100% (2/ 2)
511	100% (1/ 1)	512	100% (1/ 1)	513	100% (1/ 1)	602	100% (2/ 2)
610	100% (1/ 1)	701	100% (1/ 1)	702	100% (1/ 1)	706	100% (1/ 1)
707	100% (1/ 1)	708	100% (1/ 1)	710	100% (1/ 1)	801	100% (2/ 2)
806	100% (1/ 1)	902	100% (2/ 2)	906	100% (1/ 1)	1005	100% (2/ 2)
1101	100% (2/ 2)	1102	100% (1/ 1)	1104	100% (1/ 1)	1106	100% (2/ 2)
1108	100% (1/ 1)	1201	100% (2/ 2)	1206	100% (1/ 1)	1211	100% (1/ 1)
1305	100% (1/ 1)						

** NON-MASTERY **

OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE
102	50% (1/ 2)	105	0% (0/ 1)	109	0% (0/ 1)	202	0% (0/ 1)
204	50% (1/ 2)	208	50% (1/ 2)	211	0% (0/ 1)	213	0% (0/ 1)
301	50% (1/ 2)	303	0% (0/ 2)	304	67% (2/ 3)	305	50% (1/ 2)
309	0% (0/ 1)	310	0% (0/ 1)	312	0% (0/ 1)	313	50% (1/ 2)
314	33% (1/ 3)	315	0% (0/ 2)	401	33% (1/ 3)	403	50% (1/ 2)
406	50% (1/ 2)	407	0% (0/ 1)	409	50% (1/ 2)	411	0% (0/ 1)
506	50% (1/ 2)	507	33% (1/ 3)	508	0% (0/ 2)	510	0% (0/ 1)
514	0% (0/ 1)	601	0% (0/ 1)	603	0% (0/ 2)	604	50% (1/ 2)
605	0% (0/ 1)	607	0% (0/ 3)	703	33% (1/ 3)	704	50% (1/ 2)
705	0% (0/ 2)	709	0% (0/ 1)	803	50% (1/ 2)	805	0% (0/ 2)
807	0% (0/ 1)	809	0% (0/ 2)	901	67% (2/ 3)	903	0% (0/ 1)
904	0% (0/ 1)	905	0% (0/ 2)	1002	0% (0/ 1)	1003	0% (0/ 1)
1004	50% (1/ 2)	1006	50% (2/ 4)	1008	0% (0/ 1)	1009	0% (0/ 2)
1012	50% (1/ 2)	1016	0% (0/ 1)	1111	50% (1/ 2)	1112	50% (1/ 2)
1113	0% (0/ 1)	1203	50% (1/ 2)	1301	0% (0/ 2)	1306	0% (0/ 1)
1307	0% (0/ 2)	1308	0% (0/ 1)				

STUDENT SUMMARY LIST

218 MOANALUA
318 PRE-ALGEBRA
313 ITO L

766362 YAMAGUCHI LORI K

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1
THE MASTERY LEVEL FOR AN OBJECTIVE IS 70% AND ABOVE

** MASTERY **

OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE
101	100% (1/ 1)	103	100% (1/ 1)	104	100% (1/ 1)	105	100% (1/ 1)
106	100% (2/ 2)	109	100% (1/ 1)	111	100% (1/ 1)	112	100% (2/ 2)
113	100% (1/ 1)	201	100% (1/ 1)	202	100% (1/ 1)	203	100% (1/ 1)
206	100% (1/ 1)	207	100% (2/ 2)	208	100% (2/ 2)	209	100% (2/ 2)
210	100% (1/ 1)	211	100% (1/ 1)	212	100% (1/ 1)	213	100% (1/ 1)
214	100% (2/ 2)	301	100% (2/ 2)	302	100% (2/ 2)	310	100% (1/ 1)
311	100% (2/ 2)	312	100% (1/ 1)	402	100% (1/ 1)	404	100% (1/ 1)
407	100% (1/ 1)	409	100% (2/ 2)	501	100% (3/ 3)	502	100% (1/ 1)
503	100% (1/ 1)	504	100% (1/ 1)	508	100% (2/ 2)	510	100% (1/ 1)
512	100% (1/ 1)	514	100% (1/ 1)	602	100% (2/ 2)	603	100% (2/ 2)
610	100% (1/ 1)	701	100% (1/ 1)	702	100% (1/ 1)	708	100% (1/ 1)
709	100% (1/ 1)	801	100% (2/ 2)	807	100% (1/ 1)	904	100% (1/ 1)
1002	100% (1/ 1)	1003	100% (1/ 1)	1006	75% (3/ 4)	1012	100% (2/ 2)
1016	100% (1/ 1)	1101	100% (2/ 2)	1102	100% (1/ 1)	1104	100% (1/ 1)
1108	100% (1/ 1)	1111	100% (2/ 2)	1112	100% (2/ 2)	1206	100% (1/ 1)
1308	100% (1/ 1)						

** NON-MASTERY **

OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE	OBJ	PERFORMANCE
102	50% (1/ 2)	108	0% (0/ 1)	204	50% (1/ 2)	303	50% (1/ 2)
304	67% (2/ 3)	305	0% (0/ 2)	306	50% (1/ 2)	307	0% (0/ 2)
309	0% (0/ 1)	313	50% (1/ 2)	314	67% (2/ 3)	315	50% (1/ 2)
401	67% (2/ 3)	403	0% (0/ 2)	405	0% (0/ 1)	406	0% (0/ 2)
411	0% (0/ 1)	506	50% (1/ 2)	507	67% (2/ 3)	509	50% (1/ 2)
511	0% (0/ 1)	513	0% (0/ 1)	601	0% (0/ 1)	604	50% (1/ 2)
605	0% (0/ 1)	607	67% (2/ 3)	703	33% (1/ 3)	704	0% (0/ 2)
705	50% (1/ 2)	706	0% (0/ 1)	707	0% (0/ 1)	710	0% (0/ 1)
803	50% (1/ 2)	805	50% (1/ 2)	806	0% (0/ 1)	809	50% (1/ 2)
901	67% (2/ 3)	902	50% (1/ 2)	903	0% (0/ 1)	905	0% (0/ 2)
906	0% (0/ 1)	1004	0% (0/ 2)	1005	50% (1/ 2)	1008	0% (0/ 1)
1009	50% (1/ 2)	1106	50% (1/ 2)	1113	0% (0/ 1)	1201	50% (1/ 2)
1203	50% (1/ 2)	1211	0% (0/ 1)	1301	50% (1/ 2)	1305	0% (0/ 1)
1306	0% (0/ 1)	1307	50% (1/ 2)				

INFORMATION ABOUT ITEMS SEC-313 CRC-318 ADM- 5

ON	OBJ	ANS	INS	KIND
11	8011	3	3	OLD
12	3041	4	3	NEW
13	1094	4	3	NEW
14	6042	5	3	NEW
15	5015	4	3	OLD
16	9022	1	3	OLD
17	5113	2	3	NEW
18	8061	2	3	NEW
19	11081	4	3	NEW
20	2134	5	3	NEW
21	8071	3	3	NEW
22	7032	2	3	OLD
23	11044	1	3	NEW
24	5081	3	3	NEW
25	2041	3	3	NEW
26	9033	2	3	NEW
27	1054	2	3	NEW
28	4052	4	3	NEW
29	2145	5	3	OLD
30	9012	4	3	OLD
31	10161	2	1	NEW
32	3123	3	1	NEW
33	10091	3	3	NEW
34	11014	3	3	NEW
35	9063	2	3	NEW
36	5072	4	3	NEW
37	3072	5	3	OLD
38	10064	2	3	OLD
39	7072	2	3	NEW
40	7102	3	3	NEW
41	12011	2	3	NEW
42	5044	3	3	NEW
43	4035	3	3	NEW
44	4112	2	3	NEW
45	7015	3	3	NEW

218 MOANALUA
318 PRE-ALGERRA
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INPUT DATA LIST

-----TEST ADMINISTRATION TIME 5 (DATE 401)-----

| | | |

218 MOANALUA
318 PRE-ALGEBRA
313 ITO L

CORRECT ANSWER LIST

-----TEST ADMINISTRATION TIME 5 (DATE 401)-----

PROBLEM NUMBER		11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	
PRE-POST-RETN		3	3	3	3	3	3	3	3	3	3	1	1	3	3	3	3	3	3	TOTAL POST RETN
CODE	N A M E																			
766362	YAMAGUCHI	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	24/35 0/ 0 22/33
884386	BLANCHARD	1	1		1	1	1	1	1		1		1	1	1	1	1	1	1	23/35 0/ 0 23/33
921277	CAMELLO, L	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	27/35 0/ 0 26/33
964109	DITTO RENE		1	1		1		1	1		1		1	1	1	1	1	1		17/35 0/ 0 17/33
800120	DUCLAYAN D	1	1	1		1	1		1	1	1	1		1	1	1	1		1	24/35 0/ 0 23/33
790048	GUDOY MARV	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	27/35 0/ 0 26/33
790013	KUBOYAMA B		1	1		1	1	1	1	1	1		1	1		1	1	1	1	19/35 0/ 0 19/33
277781	MARKS STAN		1	1	1	1	1		1	1	1	1	1	1	1	1			1	22/35 0/ 0 21/33
864146	NAKANO BRI	1	1		1	1		1	1	1	1	1		1	1	1	1	1	1	25/35 0/ 0 25/33
847884	OKOUCHI, T		1	1		1				1	1	1	1	1	1	1	1		1	16/35 0/ 0 15/33
790098	POAGE SHER	1	1			1			1	1			1	1	1	1	1		1	19/35 0/ 0 19/33
869446	RAWLINS MA	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	29/35 0/ 0 27/33
966094	SIMCOX TIM	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	26/35 0/ 0 25/33
963615	SIU SUSAN	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	25/35 0/ 0 24/33
868108	TAUFETEE T	1	1	1	1	1		1	1	1	1		1	1	1	1	1	1		21/35 0/ 0 21/33
764057	TOGIKAWA K	1	1	1	1	1			1	1	1	1		1		1	1	1	1	21/35 0/ 0 19/33
800079	WATANABE M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29/35 0/ 0 28/33
963852	WATTENBARG	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	26/35 0/ 0 26/33

S-P SCORE TABLE (. --- P CURVE , * --- S CURVE)

-----TEST ADMINISTRATION TIME 5 (DATE 401)-----

PROBLEM NUMBER 12 29 38 45 19 25 11 18 35 39 33 24 17 43 31 37 28 44
23 34 15 41 20 13 36 42 21 40 16 30 27 22 14 32 26
PRE-POST-RETN 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3

| CODE | GR | N A M E | CR | AVR | xARN | EV | | |

218 MOANALUA
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OBJECTIVE AND ITEM ANALYSIS

-----TEST ADMINISTRATION TIME 5 (DATE 401)-----

TOTAL STUDENT NUMBER WHO RECEIVE TEST = 18
ABSENT STUDENT NUMBER = 6

PROBLEM	OBJECTIVE	INS	ANS	SCORE	PER %	RESPONSE (%) NO	1	2	3	4	5	OTHER	ENTROPY	WARN	EVA
12	3041	3	4	18	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	
23	11044	3	1	18	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
29	2145	3	5	18	100.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	
34	11014	3	3	17	94.4	0.0	0.0	0.0	94.4	0.0	5.6	0.0	0.3	0.0	
38	10064	3	2	17	94.4	0.0	0.0	94.4	0.0	0.0	5.6	0.0	0.3	0.4	
15	5015	3	4	17	94.4	0.0	0.0	5.6	0.0	94.4	0.0	0.0	0.3	1.2	??
45	7015	3	3	16	88.9	0.0	5.6	0.0	88.9	5.6	0.0	0.0	0.6	0.4	
41	12011	3	2	16	88.9	0.0	0.0	88.9	11.1	0.0	0.0	0.0	0.5	0.6	?
19	11081	3	4	15	83.3	0.0	0.0	0.0	5.6	83.3	11.1	0.0	0.8	0.0	
20	2134	3	5	15	83.3	0.0	5.6	5.6	0.0	5.6	83.3	0.0	0.9	0.2	
25	2041	3	3	15	83.3	0.0	0.0	0.0	83.3	0.0	16.7	0.0	0.7	0.7	?
13	1094	3	4	15	83.3	0.0	5.6	0.0	0.0	83.3	11.1	0.0	0.8	0.8	??
11	8011	3	3	14	77.8	0.0	0.0	11.1	77.8	5.6	0.0	0.0	1.1	0.1	
36	5072	3	4	14	77.8	0.0	0.0	5.6	11.1	77.8	5.6	0.0	1.1	0.5	?
18	8061	3	2	13	72.2	0.0	5.6	72.2	5.6	0.0	16.7	0.0	1.2	0.4	
42	5044	3	3	13	72.2	0.0	0.0	0.0	72.2	5.6	22.2	0.0	1.1	0.4	
35	9063	3	2	13	72.2	0.0	16.7	72.2	11.1	0.0	0.0	0.0	1.1	0.9	??
21	8071	3	3	12	66.7	0.0	0.0	22.2	66.7	11.1	0.0	0.0	1.2	0.5	
39	7072	3	2	12	66.7	0.0	0.0	66.7	11.1	16.7	5.6	0.0	1.4	0.8	??
40	7102	3	3	12	66.7	0.0	0.0	11.1	66.7	16.7	5.6	0.0	1.4	1.0	??
33	10091	3	3	12	66.7	0.0	16.7	5.6	66.7	5.6	5.6	0.0	1.5	1.1	??
16	9022	3	1	11	61.1	0.0	61.1	11.1	0.0	22.2	5.6	0.0	1.5	0.4	
24	5081	3	3	11	61.1	0.0	5.6	22.2	61.1	5.6	5.6	0.0	1.6	0.4	
30	9012	3	4	11	61.1	0.0	22.2	0.0	11.1	61.1	5.6	0.0	1.5	0.7	?
17	5113	3	2	10	55.6	0.0	11.1	55.6	5.6	11.1	16.7	0.0	1.8	0.5	
27	1054	3	2	10	55.6	0.0	0.0	55.6	0.0	0.0	44.4	0.0	1.0	0.9	??
43	4035	3	3	9	50.0	0.0	16.7	5.6	50.0	11.1	16.7	0.0	1.9	0.7	?
22	7032	3	2	8	44.4	0.0	33.3	44.4	0.0	0.0	22.2	0.0	1.5	0.5	?
31	10161	1	2	8	44.4	0.0	22.2	44.4	11.1	0.0	22.2	0.0	1.8	0.7	?
14	6042	3	5	8	44.4	0.0	5.6	5.6	11.1	33.3	44.4	0.0	1.9	0.8	??
37	3072	3	5	7	38.9	0.0	0.0	5.6	27.8	27.8	38.9	0.0	1.8	0.7	?
32	3123	1	3	6	33.3	0.0	38.9	27.8	33.3	0.0	0.0	0.0	1.6	0.6	?
28	4052	3	4	6	33.3	0.0	27.8	16.7	22.2	33.3	0.0	0.0	2.0	0.9	??
26	9033	3	2	3	16.7	0.0	11.1	16.7	11.1	33.3	27.8	0.0	2.2	0.7	?
44	4112	3	2	0	0.0	0.0	27.8	0.0	33.3	11.1	27.8	0.0	1.9	0.0	

218 MOANALUA
318 PRE-ALGEBRA
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COURSE SUMMARY BY STUDENT

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1 (ADM 1 ... 5)

CODE	N A M E		CORRECT ANS.		ADMINISTRATION (%) 1	2	3	4	5
746362	YAMAGUCHI LORI K	ALL	117/180	65%	63	63	57	80	69
		POST	13/ 21	62%	0	60	60	64	0
		RTEN	58/ 78	74%	0	100	60	90	67
		WARN			0.3	0.1	0.3	0.4	0.4
884386	BLANCHARD ROBIN L	ALL	100/180	56%	40	57	55	64	66
		POST	14/ 21	67%	0	60	100	55	0
		RTEN	56/ 78	72%	0	87	60	80	70
		WARN			0.6	0.3	0.4	0.3	0.4
921277	CAMELLO, LORNA	ALL	115/180	64%	52	65	63	64	77
		POST	15/ 21	71%	0	60	80	73	0
		RTEN	60/ 78	77%	0	100	65	60	79
		WARN			0.4	0.3	0.6	1.1	0.2
964109	DITTO RENEE	ALL	62/155	40%	27	40	45	0	49
		POST	2/ 10	20%	0	20	20	0	0
		RTEN	34/ 68	50%	0	47	50	0	52
		WARN			0.7	0.4	0.6	0.0	0.4
800120	DUCLAYAN DINAH F	ALL	94/180	52%	38	57	50	48	69
		POST	8/ 21	38%	0	20	40	45	0
		RTEN	56/ 78	72%	0	87	70	60	70
		WARN			0.4	0.4	0.3	0.8	0.4
790048	GUDOY MARVIN	ALL	108/140	77%	72	80	0	80	77
		POST	12/ 16	75%	0	80	0	73	0
		RTEN	48/ 58	83%	0	87	0	90	79
		WARN			0.7	0.7	0.0	0.4	0.2
800135	HASEGAWA TODD M	ALL	75/120	63%	50	72	65	0	0
		POST	8/ 10	80%	0	60	100	0	0
		RTEN	30/ 35	86%	0	100	75	0	0
		WARN			0.4	0.2	0.2	0.0	0.0
	KIKUCHI, GUY I	ALL	42/ 80	52%	0	40	65	0	0
		POST	6/ 10	60%	0	80	40	0	0
		RTEN	22/ 35	63%	0	53	70	0	0
		WARN			0.0	0.3	0.2	0.0	0.0
790013	KUROYAMA BRYAN K	ALL	86/180	48%	45	55	35	52	54
		POST	9/ 21	43%	0	40	20	55	0
		RTEN	43/ 78	55%	0	73	35	60	58
		WARN			0.3	0.4	0.7	0.4	0.3
790014	LAMBERT RAYMOND J	ALL	102/145	70%	65	70	70	80	0
		POST	14/ 21	67%	0	100	40	64	0
		RTEN	36/ 45	80%	0	67	80	100	0
		WARN			0.5	0.7	0.5	0.1	0.0

218 MOANALUA
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313 ITO L

CUMULATIVE ITEM ANALYSIS

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

	ITEM	ANS	INS	CORR (%)	RESPONCE (%) NO	1	2	3	4	5	ENT
OBJ 101											
	1015	2	ALL	100	0	0	100	0	0	0	0.00
			POST	0	0	0	0	0	0	0	0.00
			RETN	100	0	0	100	0	0	0	0.00
OBJ 102											
	1022	2	ALL	4	0	91	4	0	0	4	0.51
			POST	0	0	0	0	0	0	0	0.00
			RETN	4	0	91	4	0	0	4	0.51
	1023	5	ALL	88	0	0	0	4	8	88	0.66
			POST	0	0	0	0	0	0	0	0.00
			RETN	88	0	0	0	4	8	88	0.66

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CUMULATIVE ITEM ANALYSIS

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

	ITEM	ANS	INS	CORR (%)	RESPONCE (%) NO	1	2	3	4	5	ENT
OBJ 103											
	1031	3	ALL	88	4	0	4	88	0	4	0.74
			POST	0	0	0	0	0	0	0	0.00
			RETN	88	4	0	4	88	0	4	0.74
OBJ 104											
	1042	4	ALL	84	5	0	5	0	84	5	0.88
			POST	0	0	0	0	0	0	0	0.00
			RETN	84	5	0	5	0	84	5	0.88

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COURSE SUMMARY BY OBJECTIVE

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.	UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.
1	101	24/ 24 100%	1	102	22/ 47 47%
	103	21/ 24 88%		104	16/ 19 84%
	105	10/ 18 56%		106	41/ 48 85%
	108	15/ 19 79%		109	15/ 18 83%
	111	21/ 23 91%		112	42/ 47 89%
	113	21/ 23 91%			
2	201	17/ 19 89%	2	202	19/ 24 79%
	203	14/ 23 61%		204	33/ 41 80%
	206	17/ 19 89%		207	39/ 47 83%
	208	24/ 47 51%		209	38/ 48 79%
	210	17/ 19 89%		211	18/ 23 78%
	212	15/ 19 79%		213	15/ 18 83%
	214	38/ 41 93%			
3	301	36/ 46 78%	3	302	38/ 47 81%
	303	25/ 48 52%		304	48/ 64 75%
	305	25/ 47 53%		306	32/ 47 68%
	307	15/ 37 41%		309	2/ 19 11%
	310	13/ 23 57%		311	38/ 43 88%
	312	6/ 18 33%		313	26/ 47 55%
	314	25/ 70 36%		315	14/ 43 33%
4	401	26/ 69 38%	4	402	18/ 23 78%
	403	19/ 42 45%		404	20/ 23 87%
	405	6/ 18 33%		406	19/ 46 41%
	407	12/ 19 63%		409	22/ 42 52%
	411	0/ 18 0%			

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318 PRE-ALGEBRA
313 ITO L

COURSE SUMMARY BY OBJECTIVE

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.	UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.
5	501	47/ 65 72%	5	502	12/ 23 52%
	503	13/ 19 68%		504	13/ 18 72%
	506	19/ 47 40%		507	35/ 65 54%
	508	28/ 41 68%		509	19/ 46 41%
	510	12/ 19 63%		511	10/ 18 56%
	512	20/ 24 83%		513	10/ 24 42%
	514	11/ 23 48%			
6	601	6/ 24 25%	6	602	28/ 42 67%
	603	24/ 47 51%		604	15/ 41 37%
	605	3/ 23 13%		607	22/ 66 33%
	610	11/ 23 48%			
7	701	16/ 18 89%	7	702	14/ 24 58%
	703	25/ 65 38%		704	14/ 46 30%
	705	16/ 47 34%		706	12/ 19 63%
	707	12/ 18 67%		708	7/ 19 37%
	709	11/ 19 58%		710	12/ 18 67%
8	801	24/ 37 65%	8	803	16/ 46 35%
	805	13/ 42 31%		806	13/ 18 72%
	807	12/ 18 67%		809	11/ 46 24%

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CUMULATIVE ITEM ANALYSIS

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

	ITEM	ANS	INS	CORR (%)	RESPONCE (%) NO	1	2	3	4	5	ENT
OBJ 105											
	1054	2	ALL	56	0	0	56	0	0	44	0.99
			POST	0	0	0	0	0	0	0	0.00
			RETN	56	0	0	56	0	0	44	0.99
OBJ 106											
	1062	1	ALL	79	0	79	21	0	0	0	0.74
			POST	0	0	0	0	0	0	0	0.00
			RETN	79	0	79	21	0	0	0	0.74
	1064	2	ALL	92	0	8	92	0	0	0	0.41
			POST	0	0	0	0	0	0	0	0.00
			RETN	92	0	8	92	0	0	0	0.41

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COURSE SUMMARY BY OBJECTIVE

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.	UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.
13	1301	27/ 42 64%	13	1305	7/ 24 29%
	1306	7/ 23 30%		1307	20/ 47 43%
	1308	5/ 23 22%			

218 MOANALUA
318 PRE-ALGEBRA
313 ITO L

COURSE SUMMARY BY OBJECTIVE

DATA INCLUDED FROM DATE 10/19 TO DATE 4/ 1

UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS.	UNIT	OBJECTIVE	CUMULATIVE CORRECT ANS
9	901	21/ 65 32%	9	902	20/ 41 49%
	903	3/ 18 17%		904	8/ 23 35%
	905	3/ 46 7%		906	13/ 18 72%
10	1002	7/ 23 30%	10	1003	15/ 23 65%
	1004	11/ 42 26%		1005	31/ 46 67%
	1006	46/ 88 52%		1008	9/ 23 39%
	1009	14/ 41 34%		1012	29/ 47 62%
	1016	8/ 18 44%			
11	1101	35/ 41 85%	11	1102	16/ 23 70%
	1104	18/ 18 100%		1106	34/ 46 74%
	1108	15/ 18 83%		1111	38/ 46 83%
	1112	21/ 48 44%		1113	11/ 23 48%
12	1201	31/ 41 76%	12	1203	24/ 42 57%
	1206	13/ 19 68%		1211	17/ 24 71%